

COURSE SYLLABUS – ChE 441

<i>COURSE TITLE</i>	<i>ENGLISH CODE/NO</i>	<i>ARABIC CODE/NO</i>	<i>CREDITS</i>				
			<i>Th.</i>	<i>Pr.</i>	<i>Tr.</i>	<i>Tu.</i>	<i>Total</i>
Modeling and Simulation	ChE 441	هـكم ٤٤١	3	--	--	1	3
<i>Pre-requisites:</i>	ChE 321, ChE 334						
<i>Course Role in Curriculum</i>	<i>Required or Elective:</i>			Required			
	<i>A pre-requisite for:</i>						
<i>Catalogue Description:</i> This course is designed to give a chemical engineering student the ability to solve system of algebraic- differential equations. The course will develop student ability's to drive system models and simulate digitally. The student is also trained on available simulation computer packages (Design II, ChE-Cad & Math-lab).							

Textbooks:

Luyben W. L., Process Modeling Simulation & Control, 2nd edition, McGraw-Hill (1990).

Note: This text book is worldwide renowned and it is the latest edition available

Supplemental Materials:

H. Norman, Process Modeling and Computer Aided Design in Chemical Engineering, John Wiley & Sons; 2nd Edition

Course Learning Outcomes:

By the completion of the course the student should be able to:

1.	<u>Summarize</u> numerical method for solving algebraic and differential equations, single and system.
2.	<u>Describe</u> simulation, modeling and control volume for lumped parameters system.
3.	<u>Develop</u> total material balance , modeling and simulation of storage (constant and variable cross-section)
4.	<u>Formulate</u> component material balance (lumped parameters system): modeling and simulation of mixing tank and reactor tank.
5.	<u>Generate</u> energy balance (lumped parameters system): modeling and simulation for heater and reactor.
6.	<u>Prepare</u> model and simulation of CSTR in series, distillation process and combination of CSTR and distillation process in series (total balance, components balance and energy balance).
7.	Define C.V. for distributed parameter system.
8.	<u>Construct</u> component balance for distributed parameters system: modeling and simulation of plug flow reactor and diffusion systems.
9.	<u>Create</u> energy balance for distributed parameters system: modeling and simulation of non-isothermal plug flow reactor and heat exchanger.
10.	<u>Design</u> model and simulate for a closed loop system; study the effect of different controller type and controller parameters on state variable.

<i>Topics to be Covered:</i>		<i>Duration in Weeks</i>
1.	Introduction – review numerical method	2
2.	Total mass balance for lumped parameters system	1
3.	Components mole balance for lumped parameters system	1
4.	Energy Balance for lumped parameters system	1
5.	System in series	2
6.	Distillation Column	1
7.	CSTR & Distillation in series	2
8.	Distributed parameter system (Total , components and energy balance)	2
9.	Closed loop system	2

Key Student Outcomes addressed by the course: (Put a ✓ sign)

(a) an ability to apply knowledge of mathematics, science, and engineering	✓
(b) an ability to design and conduct experiments, as well as to analyze and interpret data	
(c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability	
(d) an ability to function on multidisciplinary teams	
(e) an ability to identify, formulate, and solve engineering problems	✓
(f) an understanding of professional and ethical responsibility	
(g) an ability to communicate effectively	
(h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context	
(i) a recognition of the need for, and an ability to engage in life-long learning	
(j) a knowledge of contemporary issues	
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.	✓

Key Student Outcomes assessed in the course: (a) and (k)

Class Schedule:

- Lecture: two 1.5 hour sessions per week
- Tutorials: one 3.0 hours session per week

Instructor:	Dr. Mahmoud Noor Wali
Last updated :	January 2015